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THE SWEET POTATO ROOT WEEVIL IN FLORIDA*

By K. E. Bragdon

The sweet potato root weevil *(Cylas formicarius)* is a little blue and brown beetle about a quarter of an inch in length and closely resembling an ant. The abdomen is of a bright shiny blue color, the thorax and legs are reddish brown, and the head and snout are black.

This insect infests sweet potatoes and similar plants, such as the morning glory. It seems to be particularly fond of the wild morning glory plants which grow along the Florida coast and are commonly known as "sea beans." The eggs are laid on the stems or crowns of the plants. White grubs shortly emerge from these and bore up into the stems or down into the roots or potatoes. After a certain length of time the grubs assume the pupal stage (still white or slightly tinged with yellow) and subsequently become adult beetles with their striking colors.

Since the entire life cycle is passed within the host, and the adult emerges only after complete maturity, it can be readily seen that there is no method of applying remedies in the field that will reach the insect; and that, when it is once once well established, the crop is at its mercy. As this weevil has no mercy, and also has a tendency to raise a large family, it often happens that fifty per cent or more of the potatoes are ruined by the time the farmer is ready to dig them.

However, being an industrious individual, Mr. Weevil is not content with having accomplished this much. The farmer may carefully sort out what appear to be the sound potatoes for his winter's store, but all in vain. It is practically impossible to detect his presence in every potato, and a number that are infested are almost sure to be stored with the sound ones. When

*A revision of a paper read before the May meeting of the Society.

he finds himslf surrounded with an unlimited supply of food that has escaped his ravages in the field this prolific insect immediately sets to work to finish the job. When the good housewife opens the bank or storehouse she finds that Mr. Weevil and his large family have been enjoying the fine pile of provisions so conveniently stacked up for him, and she is exceedingly fortunate if she can find any of the vegetables that are fit for consumption. Should she happen to place an infested potato in the pot or oven by mistake, the one who attempts to eat it will immediately decide that he doesn't want any dinner anyway, and will probably leave the table in a frame of mind similar to the taste in his mouth.

Unfortunately this insect has already been found in eight counties of Florida—Baker, Brevard, St. Lucie, Palm Beach, Broward, Dade, Monroe, and Sanibel and Captiva Islands in Lee. Years ago it was reported in Manatee County, but recent investigations have failed to find any traces of it there. It also infests other Gulf States and the West Indies. In this country it seems to confine its major activities to a belt of about 70 miles from salt water, which would include all of Florida, but outbreaks may occur considerably beyond this belt. Infested shipments of sweet potatoes have been intercepted at Key West and Tampa, coming from Cuba.

In sections where the sweet potato root weevil has become well established, particularly in Florida, it is practically impossible to produce sweet potatoes commercially; and one may consider himself fortunate if he can produce enough for table use.

When we consider the fact that everything in the nature of food is now at a premium, and that the sweet potato is one of the staple food products of this state (particularly for the man of moderate means) we can readily understand how very serious the general dissemination of this pest may become. It is of extreme importance that the further distribution of this insect be stopped NOW, and that some method of exterminating it in the sections already infested be adopted.

Fortunately, the insect does not travel very far of its own volition. It can, however, be sent any distance in infested potatoes, draws or slips. Infested areas should be placed under a strict quarantine; no vines or slips should be moved from these areas under any circumstances; and potatoes which are stored or sold should be fumigated with carbon bisulphide. Care should be taken to store potatoes at some distance from any

infested fields, and no potatoes, roots or vines should be left in the fields but should be cleaned up and destroyed. If the growing of sweet potatoes could be entirely abandoned within infested areas for a year or two it is probable that the weevil could be starved out unless morning glory plants were present.

Extreme care should be taken by everyone who contemplates selling or purchasing sweet potato vines for planting. The purchasers should find out from the state authorities (The State Plant Board, Gainesville, Fla.) if the sections from which they expect to make purchases are known to be infested, and should insist that plants be accompanied by certificates of the State Plant Board. Sellers should have their premises inspected by competent inspectors before offering plants for sale. This is a patriotic duty on their part, since they are not only likely to ruin the crops of their customers, but may be the means of materially reducing the food supply of the state and nation in this time of great need.

Recent rulings of the State Plant Board have prohibited the importation from other states and countries of sweet potatoes or vines, and have established quarantines on certain areas within the state known to be infested. Everyone dealing in sweet potatoes should inform themselves of these rulings before making shipments.

Whoever discovers an insect that resembles the description given should immediately send it to the porper authorities *after killing it* in alcohol, gasoline, kerosene, or other similar substance. Complete data as to when and where found should accompany the specimens.

A survey of the State has already been inaugurated by the State authorities, and the Federal government has already decided to take active steps looking towards its control or eradication.

HUMBLE-BEE

Burly, dosing humble-bee,
Where thou art is clime for me.
Let them sail for Porto Rique
Far-off heats through seas to seek
I will follow thee alone,
Thou animated torrid-zone!

(*Emerson—The Humble-Bee.*)

WHAT THE FLORIDA CITRUS GROWER NEEDS *

By W. W. Yothers,
Bureau of Entomology, Orlando, Fla.

For several years we have wondered why so many of the prominent citrus growers failed to appreciate the full value of insect control. We have visited many growers who have an enviable social standing, superior intellect, and who have amassed more or less wealth, who were not interested in the control of insects on their trees by any artificial means. We must confess that this attitude has dampened our enthusiasm and has therefore hindered us in our work. We have had meetings of the Florida Horticultural Society for 30 years, we have had a State University for many years with short courses and seminars for the dissemination of knowledge, and this laboratory has been located in Orlando for nine years, but for some reason many of the citrus growers have never been reached and know nothing of any researches which have been done in this State. Many of them do know about the researches, but are not interested enough to take action.

More than a year ago we visited a community and the result of this visit gave us our first idea as to the needs of the Florida citrus grower. After eight years residence the idea came to us as to what the trouble might be. We have decided that it is practically useless to talk to the people about some insect or animal which they have never seen and about which they can form no idea as to its appearance, how it gets its living, or what injury it might do. It is equally useless to write learned bulletins on a pest whose appearance the grower has no conception of and knows nothing of its life history or biology. Bulletins of course are all right if a grower knows or understands what he is reading about. We decided more than a year ago that the lack of entomological knowledge was the fundamental difficulty of the growers. Most of them do not know rust mites or their eggs even if they chanced to see them. Neither do they know where they are found, either in the summer or in the winter. They do not know if they have the appearance of an elephant or a monkey. Nor do they understand the appearance of scale insects or the whitefly any better. A great many growers do not know that nearly all the injurious insects

*Published by permission of the chief of the Bureau.

on citrus insert a beak into the trees for the extraction of juices. Neither do they know what this beak looks like, nor do they know the appearance of the young insects.

About a year ago we visited the foreman of six groves in company with the State Superintendent of these groves. We carried a binocular microscope with us in order to show each foreman the insects present. First a trip was made through the grove and such pests as were present were found and more or less instruction was given in the grove. Samples of these pests were then taken to some convenient place where they were examined under the microscope. An attempt was made to be more or less systematic in presenting this information. We showed them the eggs, young and adults of the most serious pests in their particular grove. No attempt was made to give instruction about insects which were not found in the grove. We also attempted to give instructions regarding beneficial insects, parasites and friendly fungi. Methods for the control of these pests were then discussed as each insect was examined. It would appear that this trip was of great value to the foreman in question, and the superintendent asked me to set apart a week so that the men could come to Orlando for further instruction.

Since this first series of meetings met with such success it was thought advisable to have additional meetings where the growers of a community might take advantage of seeing insects. We held six meetings, all of which were apparently very successful. It was soon found out, however, that such instruction and demonstrations should be accompanied with either a printed or a mimeographed synopsis of the information given. This office has had in mind for some time the preparation of such a course for those people who have spraying demonstrations for this office, but so far nothing has ever been done. These meetings have demonstrated to this office that a laboratory, or a demonstration, or a seminar should be carried to the grower as an individual. We see that our efforts in having the individual come to us have not been entirely satisfactory or successful. It is now up to us to take the results of our researches direct to the grower. This is now being done to a limited extent by the county demonstration agents and we look to them to add a half million dollars annually to the citrus industry.

THE ANOPHELES MOSQUITO IN RELATION TO MALARIA AND AGRICULTURE *

By C. E. Wilson

In considering the recent development, as brought to light, in the past few years on the role of insects as transmitters of disease, I think best to give very briefly a general history of this development.

From all appearances it is natural to suppose that insect transmission of disease has come abruptly into prominence; this, however, is not the facts, for at no time and in no case have great movements or great discoveries been produced suddenly. Centuries ago there was suggested the possibility that insects were associated with the cause of disease and through these early suggestions we have obtained our present knowledge.

Perhaps one of the earliest references to this subject is by an Italian physician, Mercurioles (1530-1607). This was during the period of the plague or "black death." In regard to its transmission he wrote: "There can be no doubt that flies feed on the internal secretions of the diseased and dying, then, flying away, they deposit their excretions on the food of neighboring dwellings, and persons who eat of it are thus infected."

Another of the early writers who deserves consideration is a German Jesuit named Kircher (1658.) He discovered bacteria long before Leeuwenhoek, and to these attributed the cause of disease.

Passing to almost modern times we find in 1848 that Dr. Josiah Nott of Mobile, Ala., published a rather remarkable paper on the cause of yellow fever and malaria, yet his work has been greatly overrated and his theories of mosquitoes, aphids and cotton worms as causative agents were used without the significance of modern science.

In 1853 Beauperthuy, a French physician, discussed the role of mosquitoes in transmission of malaria. In regard to Beauperthuy's work Boyce says: "It is Dr. Beauperthuy whom we must regard as the father of the doctrine of insect-borne disease."

A definite and conclusive mass of argument to support the belief of malaria being transmitted by mosquitoes was brought about in 1883 by an American physician, A. F. A. King, and

*Read before the June meeting of the Florida Entomological Society.

about the same time Dr. Finley of Havana, Cuba, presented his facts in regard to mosquito transmission of yellow fever.

To return to the topic of discussion for this evening, we find as intermediate hosts for the malaria plasmodum, three species of Anopholes mosquitoes, namely: A. crucians, purely southern species; A. quadrimaculatus, a species of general distribution; and the third species causing the transmission is A. punctipennis, which is also of general distribution. These mosquitoes are the agents of transmission for a protozoan blood parasite which causes a breaking down of the red blood corpuscles, and produces a condition commonly termed "chills and fever," or malaria. In favorable conditions these fever attacks occur every 48 hours.

Three principal types of the disease are known. They are: 1, the benign-tertian, caused by *Plasmodium vivax,* which completes its cycle of development every 48 hours, producing the feverish condition. This type is wide spread and common; 2, the quartan fever caused by *Plasmodium malaria,* having a cycle of 72 hours and is more prevalent in temperate and tropical regions, but appears rarely everywhere; 3, sub-tertian or pernicious fever caused by *Plasmodium falciparum.* This is an irregular type of fever and the life cycle of the parasite takes place in the internal organs, principally the spleen, instead of in the peripheral circulation.

Being accustomed, as we are, to malaria in this country, little importance do we place upon it, yet if we should look on the mortality side of the question, the facts no doubt appear astounding. In Italy it causes an average annual mortality of 15,000 out of each 2,000,000 cases. In India it claims annually 1,136,000 persons. In 1911 in Alabama 70,000 cases of malaria were known and of this number 770 cases were fatal.

From my personal observation in South America, and also in the Mississippi Delta region, I should say the figures for Alabama are very conservative.

Having briefly passed over a few of the important facts let us turn back to the life cycle of the *Plasmodium vivax* and see the importance of the mosquito in its development.

In the adult stage *Plasmodium vivax* is found living as an amoeboid, intracellular parasite in the red blood corpuscles of man. In the life cycle two well defined stages are noted; Shizogony (fision), and Sporogony (or spore formation).

(Continued on page 22)

The

FLORIDA BUGGIST

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In this issue we print a very timely article by Mr. W. W. Yothers of the Orlando laboratory of the U. S. Bureau of Entomology. To every citrus grower reading this article it will become plain, we feel confident, that he needs *The Florida Buggist*. He might also attend the Citrus Seminar at the University Oct. 9-12 and the seminar class duirng the preceding week.

During the quarter covered by this number the extra large sweet potato crop of the state will be largely harvested. Especially opportune, therefore, is the article by Mr. Bragdon on the sweet-potato root weevil. Mr. Bragdon has by no means exaggerated the dangerous character of this pest. Indeed we feel that he might have put considerable more "frightfulness" into the article and still been well within the truth. Ever since the discovery of the weevil in one of our chief potato producing counties the seriousness of the situation has been apparent. The history of this infestation should impress upon our readers the importance of promptly reporting to some proper authority the presence of any new crop pest. Altho this weevil has undoubtedly been in Baker County for some years, not until last November when specimens were brought to the Experiment Station was the matter reported to any entomologist.

In this number appears the major portion of a paper read by Mr. C. E. Wilson before the June meeting of the Society. The control of malaria is perhaps the greatest problem before the South today, except of course the trouncing of the Germans. The conservation of human life and health is of vastly more importance than that of wealth. Altho our State has much less

malaria than some others it still has too much. The editor has on several occasions gotten himself "in bad" with certain citizens of a "boosting" frame of mind by this line of talk but is still willing to repeat the offense. Indeed to mention malaria in a real estate office is nearly as serious a breach of etiquette as to mention earthquakes in California.

"For every evil under the sun
There is a remedy, or there's none.
If there is one try and find it;
If there is none never mind it."

Now it is not necessary even to try and find the remedy for malaria. It is well known. We need only apply it. Hence the man that adopts the "never mind it" policy is, instead of a real booster, in the end a heavy "knocker," as he hinders and puts off the day of the State's clean up and highest development. He is more foolish than the proverbial ostrich which hides its head so it cannot see the lion. An ostrich squatting on the ground with its head hidden looks like a stone and may escape the lion's notice. But no such "camouflage" will work against Anopheles nor for long against the prospective settler. There are too many posters advertising "chill tonics" on our trees and bridges. While it is true that we may secure almost perfect safety anywhere in Florida by properly screening our houses and staying in them after dark, we have not done our full duty to our communities by retiring behind our screens. Let us keep up the agitation until our neighbors' houses *and our churches* are screened. Many of our citizens are too accustomed to mosquitoes to notice or attach the proper importance to mosquitoes. An amusing illustration of this occurred a few months since. A lecturer was talking on the subject of screens and mosquitoes. A lady in front of us turned to her companion and remarked: "We don't have any screens in our windows and we don't have any mosquitoes," and even as she spoke she was vigorously scratching a collection of typical swellings on her arm.

ANT

While an ant was wandering under the shade of the tree of Phaeton, a drop of amber enveloped the tiny insect; thus she, who in life was disregarded, became precious by death.

(*Martial—Epigrams Bk. VI, Ep. 15.*)

THE ANOPHELES MOSQUITO IN RELATION TO MALARIA AND AGRICULTURE

(Continued from page 19)

This has in a brief way served to illustrate the relation of the mosquito to malaria and so brings us to the second part of the evening's topic, the relation to Agriculture.

Generally speaking, I doubt if this side of the question has scarcely attracted your attention, yet if you stop a moment to consider the enormous losses in crops and waste of uninhabited land due to malaria, the results are amazing.

A beginning along this line was made by Herrick in 1903 when he showed that in the Southern United States the effect of malaria was retarding the development of the country and rendering practically uninhabited some of the most fertile regions of the world, namely, the great Mississippi delta.

A more accurate estimate was made in 1909 when Dr. L. O. Howard placed the annual money loss from malaria in the United States at not less than $100,000,000.

This seemed to cause an awakening of the Bureau of Entomology and as a result Mr. D. L. Van Dine has been stationed for the past few years at Mound, La., and Mr. James K. Thibault, Jr., at Scott, Arkansas. The results of their observations were published in the Southern Medical Journal for March, 1915, and I will briefly give a review of their results.

It is generally known that the Anopheles mosquito larvae thrive best in shallow margins of swamps, ponds, slow moving streams, grass grown springs, and land locked pools, or in other words the abundance of the mosquito in a region is in direct proportion to the extent of water collections.

Malaria, unlike yellow fever, is of rural origin, and decreases in proportion to the decrease of natural collections of surface water; that is as large areas of land have been drained and brought under cultivation, thus destroying the breeding places for the mosquito. Malaria has decreased in direct ratio to the amount of decrease in surface water.

If a map of the United States was made to locate the swamps, undrained lands and lands subject to overflow, you would find that you would also indicate:

(1) Regions known to be malarial;

(2) Areas which include the distribution of one or more species of mosquitoes that transmit malaria;

(3) The most fertile lands in the United States;

(4) Lands which offer the most in crop returns, and are less developed than any agricultural regions of similar extent in the United States.

To show the large amount of acreage that would be included in the above heads I will quote from Senate Document 443, 60th Congress, 1st session. "There are 79,000,000 acres of swamp lands and lands subject ot overflow in the United States, the bulk of which is agricultural land of the greatest potential productiveness. 55,000,000 acres of this land are located within the Southern States, and 24,000,000 acres alone are in the lower Mississippi Valley. These figures do not include 150,000,000 acres of land in the U. S. not classed as swamp land and not subject to overflow, but which are in need of drainage. The larger portion of this immense area also lies in the Southern States."

The place selected for Van Dine's work was the Hecla Plantation, on which the town of Mound, La., is located. This plantation contains 3,500 acres of land; 1,800 acres being in cultivation and 1,700 acres in swamps and timber. The farming is done by negro tenant families, of which there are 74. The crops consist principally of cotton, corn and cowpeas.

The interference of malaria with these tenants amounted to 970 lost days as reported to the physician plus 487 days not reported. This does not include the time lost by persons waiting on the patients, and does not include the cases under 8 years of age. To figure in the amount of time lost by waiting on patients gives a total of 1,842 days lost through malaria. The loss of this labor made an estimated loss in the crop yield for this plantation alone of 487 bales of cotton and 4,035 bushels of corn.

Mr. Thibault's work at Scott, Arkansas, was of very similar nature to Mr. Van Dine's, and the actual time loss and estimated crop loss are in approximately the same ratio, so I will not take up the time to review his results.

BEETLE

O'er folded blooms
On swirls of musk,
The beetle booms adown the glooms
And bumps along the dusk.

(James Whitcomb Riley—The Beetle.)

PERSONALS

Dr. E. W. Berger, the president of the Society, has recently returned after two weeks spent in Ohio.

Mr. C. E. Wilson, Assistant Entomologist of the State Plant Board, Gainesville, Fla., has resigned and gone to Bloomington, Ind., where he becomes instructor in zoology at the University of Indiana. Mr. Wilson will also do university work towards obtaining the Ph. D. degree.

Mr. W. W. Yothers, of the U. S. Ent. Lab. at Orlando, has been spending several months in Washington, D. C.

Mr. H. L. Dozier, formerly Laboratory Assistant in Entomology at the Experiment Station, who has been holding a temporary appointment with the U. S. Bur. Ent. at Columbia, S. C., has secured a permanent appointment and has been sent to Tempe, Ariz.

Mr. A. C. Mason, also formerly Laboratory Assistant at the Station and later Assistant Entomologist of the Plant Board, who has been in Texas all summer working for the Federal Horticultural Board in their attempt to keep the Pink Bollworm out of the U. S., has been called to the colors.

Dr. H. S. Davis, our vice-president, has returned to the University from Iowa, where he spent his vacation in the laboratory of the U. S. Bureau of Fisheries at Fairport.

A member of our Society, Mr. Kurt F. Innecken, P. O. Box 900, Savannah, Ga., desires to exchange Lepidoptera with some one in Florida, especially in the southern part of the State.

Mr. F. F. Bibby, Assistant Nursery Inspector of the Plant Board, has been transferred to Gainesville as Temporary Assistant in the Department of Enomology, in place of Mr. C. E. Wilson, resigned.

Mr. A. H. Byers, Entomologist, Bur. of Ent., U. S. D. A., was a recent visitor at Gainesville, where he is conducting experiments in cooperation with Prof. J. R. Watson, Entomologist of the Fla. Expt. Station.

The Pink Boll Worm has been discovered at Hearne, Texas. This pest, whose native habitat is probably India, was introduced into Mexico on cotton seed from Egypt, and is now menacing the cotton industry of the U. S. The worm is the caterpillar of a small moth, *Gelechia gossypiella*. Entomologists of the Federal Horticultural Board are making every

effort to eradicate the same from Texas before it becomes permanently established.

Aschersonia cubensis, a fungus parasite of scale insects, has recently been found infecting the Magnolia Scale *(Toumeyella liriodendri)* at Gainesville, Fla., and the Palm, or Tessellated Scale *(Eucalymnatus tessellatus)*, on Tabernaemontana, at Oneco, Fla. At the former place the scale has been almost eradicated. This fungus has apparently not previously been identified in Florida although probably quite common.

—E. W. B.

SUMMER MEETINGS

The June Meeting. On the 18th the members met in Dr. Davis' lecture room as usual, but there was such a large number of visitors present, mostly students in the Summer School, that the society adjourned, upon invitation from Dr. Flint, to the Chemical Lecture room. Here Mr. C. E. Wilson gave the paper of the meeting. We print it, in part, in this issue. Mr. Watson exhibited moths of the True Army Worm *(Heliophila unipuncta*, Haw*)*. This is the first definite record of the presence of this insect in Florida. It is surely comparatively rare here altho abundant further north. It should not be confused with the Fall Army Worm *(Laphygma frugiperda)*.

At the meeting of the Society in July, Dr. E. W. Berger gave a lecture, illustrated by lantern slides, on the housefly, setting forth the dangers of this apparently harmless insect to the health of the individual and the community. Its breeding places, such as manure, privies, and masses of decaying filth, should be cleaned up or kept screened to keep off the flies. Kitchens, dining rooms, and places where food is kept should of course be screened.

Because a large number of our members were to be out of the city at that time it was voted to dispense with the August and September meetings.

BEE

The bee is enclosed, and shines preserved, in a tear of the sisters of Phaeton, so that it seems enshrined in its own nectar. It has obtained a worthy reward for its great toils; we may suppose that the bee itself would have desired such a death.

(*Martial—Epigrams, Bk. IV, Ep. 32.*)

NEW MEMBERS

The following have been elected to membership in our Society since our last issue:

U. C. Zeluff, Deputy Port and Railway Inspector, State Plant Board, Pensacola, Fla.

Fritz Fuchs, Inspector, State Plant Board, Fort Myers, Fla.

Luther Brown, Port and Railway Inspector, State Plant Board, Gainesville, Fla.

W. N. Hull, Deputy Port and Railway Inspector, State Plant Board, Miami, Fla.

James Kerr, Inspector, State Plant Board, Santa Rosa, Fla.

Dr. Hiram Byrd, Scientific Secretary, State Board of Health, Jacksonville, Fla.

Harold Mowry, Inspector, State Plant Board, Santa Rosa, Fla.

C. A. Bass, Inspector, State Plant Board, Fort Myers, Fla.

R. G. Bateman, Inspector, State Plant Board, Fort Myers, Fla.

J. Marcellus Javens, Mount Dora, Fla.

F. F. Bibby, Temporary Assistant, Entomological Department, State Plant Board, Gainesville, Fla.

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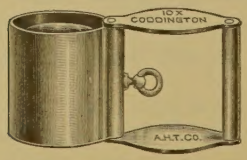

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